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DISEASES DUE TO PROTOZOAN PARASITES.

VAN DER ELST, NOCKERMAN & MISSAL. Lutte contre la trypanosomiase animale au Katanga. [**The Campaign against Animal Trypanosomiasis in Katanga.**]—*Bull. Agric. Congo Belge.* 1929. Sept. Vol. 20. No. 3. pp. 374–394.

The authors summarize in eight sentences the general outlines of the methods adopted for the control of trypanosomiasis, but the bulk of the paper is made up of records of experiments in the treatment of trypanosomiasis with various drugs.

The general lines laid down are :—

(1) The production of a veterinary certificate to the effect that animals which it is desired to import are free from detectable contagious diseases (including trypanosomiasis).

(2) Veterinary inspection at places of entry.

(3) Vehicles for the transport of animals through fly belts must have all openings covered with metallic gauze.

(4) Animals transported by road must use specified routes only.

(5) Areas around breeding establishments and on cattle routes in fly areas are deforested.

(6) Breeding establishments known to be infected are quarantined and the necessary sanitary regulations are put into force.

(7) Animals are liberated from quarantine to go to abattoirs only. They must be given intravenous treatment with tartar emetic and killed within a short time, before the effects of the drug have passed off.

(8) Therapeutic measures. The authors are carrying out investigations with a view to finding an effective remedy and method of treatment for infection with *T. dimorphon* in cattle. They have obtained results which they consider encouraging. Two animals treated with a mixture of emetic and moranyl on March 14th and May 14th, 1928, were still negative at the time of writing (September 20th, 1928).

Experiments with drugs.

Details of four experiments with 2754 Hoechst are given. This drug is, according to the authors, closely related to tryparsamide, and

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they therefore decided to use it in a manner similar to that employed in treatment with tryparsamide, that is to say, "Two periods, separated by a month's rest, of eight intravenous injections at weekly intervals." They do not appear to have carried out that plan in any of the four cases cited, but in any case they come to the conclusion that 2754 exerts no curative effect and it is very toxic. The cases referred to in detail form one series of tests which are being continued. One animal (apparently belonging to another series) which had been treated unsuccessfully with emetic, naganol, tryparsamide, and emetic+trypoxyl was given 3 doses of 1 gramme of emetic and 2 doses of 5 grammes of moranyl (Poulenc), the drugs alternating with each other on consecutive days. The blood became negative on the day after treatment was begun, and remained negative up to the time of writing (communication dated July 15th, 1928).

A second animal unsuccessfully treated with emetic + tryparsamide, emetic + naganol, and Bayer 205 was given similar treatment with a like result.

It is admitted that the preliminary unsuccessful treatments may have been not without influence upon the results.

Brief tabular statements of 22 experiments, in each of which one animal was used and in which various drugs or combination of drugs were used, are given. The authors conclude that the only treatment giving encouraging results is the moranyl-emetic treatment. Reference has already been made to the two animals treated with this combination. These two animals appear in several of the tests with different drugs. It would seem that the drugs which the authors found ineffective were: Emetic alone, 2754 Hoechst, naganol, trypoxyl, tryparsamide, emetic+trypoxyl, emetic+tryparsamide, atoxyl, emetic+2754, emetic +atoxyl, emetic+naganol, moranyl alone.

They record two failures with emetic and moranyl. One animal had received two doses of each of these and died on the 4th day after treatment stopped. The authors seem inclined to attribute this to the reduction in the number of doses of emetic by one.

The other animal was given only 0·5 gramme of emetic as the first dose, because in other experiments the authors had had losses when 1 gramme was injected into animals whose blood contained large numbers of trypanosomes.

One experiment is recorded by van der Elst and Missal under the date March 15th, 1929, in which a mixture of sulpharsenol and 309 was tried. The conclusion arrived at is that it has no curative action on *T. dimorphon* (*congolense*) infections in bovines.

Writing under the date April 25th, 1929, the same two authors report further 12 experiments in treatment.

One animal which had relapsed on the 12th day after emetic and moranyl was subjected to this treatment again (September, 1928). The animal was negative for trypanosomes (thick films stained Giemsa) up to the time of writing. This treatment in one instance failed to effect a cure, trypanosomes reappearing on the 17th day. The treatment was repeated 10 days later and the animal died two days after treatment stopped.

An animal which received on successive days emetic 1 gramme, moranyl 5 g., naganol 5 g., moranyl 5 g., tryparsamide 10 g., and emetic 1 g., relapsed 11 days after treatment stopped.

NIESCHULZ (Otto) & WAWO-ROENTOE (F. K.). De sublimaat-reactie volgens Bennett en Kenny en de surradiagnose bij runderen. [**The Sublimate Reaction of Bennett and Kenny in the Diagnosis of Surra in Cattle.**]—*Tijdschr. v. Diergeneesk.* 1929. Nov. 1. Vol. 56. No. 21. pp. 1133–1136. English summary (6 lines) p. 1136.

The authors have carried out the sublimate test with serum from an infected beast twice, and as controls have used sera from twenty healthy animals. They found that there was no difference in the reactions given by these animals.

In tests in which three infected and three healthy guineapigs were used there was a slightly more pronounced reaction in the case of the infected guineapigs, but it was of no practical significance.

NIESCHULZ (Otto) & WAWO-ROENTOE (F. K.). Over den invloed van miltextirpatie op het infectieverloop der surra bij honden. [**The Effect of Removal of the Spleen on the Course of Surra in Dogs.**]—*Tijdschr. v. Diergeneesk.* 1929. Nov. 1. Vol. 56. No. 21. pp. 1128–1132. English summary p. 1132.

In the experiment recorded in this paper three dogs which had had their spleens removed 22, 8, and 1 day prior to infection and two normal control dogs were used.

In the splenectomized dogs the period of incubation was 7 to 8 days and in the controls 8 days. The three splenectomized dogs died in 11 to 13 days after infection, with trypanosomes present in their blood in large numbers. One of the controls died on the 33rd day after infection and the other was used for another experiment on the 32nd day.

SICÉ (A.) & MALBRANT (R.). Nouveaux essais de préservation des bovidés contre les trypanosomes par le 309 Fourneau. [**New Attempts to protect Bovines against Trypanosomes by Means of 309 Fourneau.**]—*Bull. Soc. Path. Exot.* 1929. Nov. Vol. 22. No. 9. pp. 776–779.

It was intended to test the value of 270 F. (sodium salt of acetyl-p. amino-oxyphenylarsenic acid) as well as 309 Fourneau (urate of meta-aminobenzoyl - paramethyl - meta - aminobenzoyl - amino - naphthalene-trisulphonate of sodium 4–6–8), but owing to a mischance 270 F. was not available.

The animals used comprised 20 oxen ranging from 4 to 7 years of age, free from trypanosomiasis, travelling from Melfi to Bangui. No protective treatment was given prior to starting.

At Korbol, one week's journey, at the border of fly country, 12 of the animals were given doses of 309 ranging from 3 to 5 g. (according to weight) subcutaneously. The injections produced local reactions and systemic disturbances, which, however, had disappeared in 48 hours. The march was then resumed, and as it was the intention to test the protective powers of the drug, the experiment was not falsified by traversing fly areas at night. Nineteen days after flies had first been encountered and 25 days after the injection of the drugs some animals presented suspicious symptoms, and on arrival at Fort Crampel 5 days later examinations were carried out. One of the animals treated had

died of piroplasmosis some days before, and of the remaining 11, 3 were found to harbour *T. cazalboui*; while of the 8 controls 3 were also infected.

Five animals, of those injected, and not presenting any symptoms, were again injected subcutaneously with 309 Fourneau in the same doses as before. Before reaching Bangui four animals, including the three already recognized as infected, had died, but only two of these were considered to have died of trypanosomiasis. The other two died of piroplasmosis (*P. bigeminum*). One further animal was sold en route.

Fourteen animals arrived at Bangui. Of these 3 had received one injection, 4 two injections and 7 controls. Examined on arrival, no fresh infections were found in the first group, one in the second and one among the controls.

Summarizing the whole test :—

42·8 per cent. of those receiving one injection became infected, 20 per cent. of those receiving two, and 50 per cent. of the controls.

The authors conclude that in doses of 5 to 7 cg. per kilo injected subcutaneously 309 has no protective properties. It is suggested that with much larger doses ("limit" doses as the authors suggest they might be called) other results would possibly accrue, but that is impracticable on the score of cost.

NIESCHULZ (O.). Zoölogische bijdragen tot het surraprobleem. XXVI. Over den incubatietijd bij surrainfecties. [**Zoological Contributions to the Surra Problem. XXVI. The Incubation Period of Surra.**]—*Ned.-Ind. Blad. v. Diergeneesk.* 1929. Vol. 41. No. 3. pp. 253–263. German summary pp. 263–264.

Exact knowledge regarding the period of incubation is of great value in more than one connexion in the problem of the control of surra. Quarantine regulations must take it into account. It is of importance, too, in seeking the origin of infection in cases occurring in areas hitherto free from the disease, and in determining what period of observation is required in experiments yielding negative results.

In experiments with equines, using various kinds of Tabanidae, Chrysops and Haematopota both by direct transference and after intervals ranging up to 3 hours, the period of incubation does not vary very greatly. In 22 experiments the period ranged from 7 to 10 days (with one exception of 13 days), with an average of about 8½ days. This proved to be the case whether horses, buffaloes, guineapigs or rats provided the infection. Nor, in a few experiments, was any difference noted between half-bred imported and native horses.

One experiment with a macacus monkey and *Tabanus immanis* gave an incubation period of 8 days.

In dogs the period would seem to be far more variable. Only two experiments are recorded (*T. rubidus* from horses) and the periods were 8 and 28 days respectively. Guineapigs also yielded very variable results, ranging from 7 to 46 days, but the majority (80 per cent.) were infected within 20 days, with an average of 15 days. Rabbits, on the other hand, gave very constant figures of 5 to 14 days, with an average of 7. With rats the results were similar to those obtained with rabbits. Three experiments were done with mice and the period ranged from 6–8 days. In suspected cases in horses which have not been treated experimentally examination for 14 days is, for all practical purposes, sufficient to allow a diagnosis to be arrived at. With animals which

have been treated with Bayer 205 a longer period of observation is necessary. But in laboratory experiments horses must be kept under observation for three weeks, rabbits and rats a month, and guineapigs two months before it can be said that a definitely negative result has been obtained.

In experiments with guineapigs the results appeared to indicate that the period of incubation was longer when the infection was derived from horses than when it was furnished by small animals. Possibly passage through small animal is responsible for this reduction in the period.

ALLEN (H.). **Observations on an Outbreak of Equine Surra, with Special Reference to the Question of Vectors, and to Measures for Control.**— *Vet. Jl.* 1930. Feb. Vol. 86. No. 2. pp. 51–63.

"It is not often that the veterinary worker is called upon to deal with a veritable outbreak of equine surra. . . . When, therefore, an outbreak of surra occurred in the depot in his charge, the writer at once set about keeping a careful record of not only the progress of the disease from day to day, but also of such factors as were deemed of value in investigating the genesis of the outbreak."

The author describes the situation of and the nature of the country surrounding the depot (Mona) at which the outbreak occurred. He then summarizes very briefly some of the literature regarding "Etiological factors in relation to the prevalence of biting flies," and states that the fundamental fact which emerges is that water and vegetation are essential conditions for Tabanidae. Both of these conditions were in prolific abundance at Mona. The question must, however, be viewed also from the standpoint of the seasonal prevalence of Tabanidae. It is a remarkable fact that while certain species of Tabanus and other flies have been proved capable of transmitting surra in various parts of India the author failed to secure a single Tabanid during the whole course of the outbreak (November-December) in spite of a very careful search day by day.

Of 1,094 horses 143 were affected and 94 cases occurred at one place, where only three animals escaped infection. The outbreak was extremely virulent, as horses became comatose and paralysed within 2-3 days of the detection of trypanosomes in their blood. Trypanosomes were observed in the blood of some horses, during routine examinations, which showed no clinical symptoms. Shortly before the outbreak began all the animals had been subjected to close examination (annual inspection for soundness), and none showed any indications of being infected with surra. Special mention is made of the fact that flies were numerous throughout the depot during October, far more numerous than during November, and it is inferred that if surra had been present during October it would have spread throughout the animals. A consideration of all the circumstances attending the outbreak indicates that Tabanidae were the transmitting agents to some extent, but the possibility that stomoxys and other flies were concerned cannot be excluded. The fact that the outbreak continued through December when no biting flies were in evidence indicates the possibility that biting flies were not the only vectors. This question turns upon the duration of the period of incubation in naturally contracted surra. It is not possible to give an answer to this question from a consideration of the circumstances of the outbreak.

For the prevention of a recurrence of surra at the depot it is recommended that a systematic examination of the animals in the neighbouring villages should be made during July-November, that a *thorough* clearance be made of jungle and scrub around the station, that efforts be made to control all possible vectors by reducing possible breeding-places, and the systematic prophylactic use of a trypanocidal agent. It is suggested that 10 cc. of 10 per cent. solution of Bayer "205" per 1,000 lbs. weight be given intravenously at fortnightly intervals.

DU TOIT (P. J.). **A Note on the Diagnosis of *Trypanosoma vivax* Infection.**—*Union of S. Africa. 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 3–6. With 4 figs.

The author refers to the difficulties associated with the detection of *T. vivax* in the blood of animals showing symptoms of nagana. While *T. congolense* is seldom absent from the circulation for long, *T. vivax* is very rarely seen even in living preparations.

Details are given of a series of inoculations carried out with, as the starting point, a heifer upon which *G. pallidipes* from Zululand were fed. It was not suspected that these flies were infected. Details of the various experiments show that it was very rare to find *T. vivax* in the blood.

Finally, in the course of an examination of gland smears for stages of Gonderia infection *Trypanosoma vivax* was found readily. Thus confirmation is forthcoming of the discovery made by HORNBY and reported in 1921 that *T. vivax* is more readily found in gland smears than in blood.

A batch of 6 animals was inoculated with blood containing *T. vivax* and systematic examinations of blood and gland juice were made. These showed that the trypanosomes occur in films of gland juice twelve times as frequently as in blood films, and the parasites are often numerous in the former. In no case were trypanosomes found in the blood when they were absent from gland smears. Stained films are said to be better than moist preparations for detecting trypanosomes in gland preparations.

YORKE (Warrington), ADAMS (A. R. D.) & MURGATROYD (F.). **Studies in Chemotherapy. I. A Method for maintaining Pathogenic Trypanosomes Alive in Vitro at 37° C. for 24 Hours.**—*Ann. Trop. Med. & Parasit.* 1929. Dec. 31. Vol. 23. No. 4. pp. 501–518.

The experiments described in this paper were carried out with the object of devising some means of keeping trypanosomes alive *in vitro* at 37° C. for the purpose of investigating the manner in which certain arsenical compounds act in experimental trypanosomiasis.

It appears to be generally agreed that serum forms a better medium than any artificially prepared medium, and also that survival is longer at room temperature than at body temperature. That far more work has been done in this connexion at the lower temperature would appear to be an indication that other workers have experienced this difficulty of maintaining trypanosomes alive at the higher temperature.

Three strains were used, one of *T. equiperdum*, which has been maintained in mice for many years, one of *T. rhodesiense* isolated from

a man in 1923 and since maintained in mice, and a strain of *T. gambiense* isolated from man in 1922 and since maintained in mice.

Dilutions of blood swarming with trypanosomes were made in series decreasing to $\frac{1}{10}$ each time in rabbit serum. Prior to making the first dilution in serum the blood itself was diluted with 2 volumes of sterile citrated saline.

Difficulty was experienced in finding a means of closing the tubes. Liquid paraffin, as used by PAPAMARKU, was discarded as droplets of the oil interfered with counting the trypanosomes. Plasticene caps and cotton wool plugs were abandoned, as heating the lips of the tubes produced substances toxic to the trypanosomes, and dust falling from the cotton wool appeared to have a detrimental effect. The trypanosomes showed a marked tendency to adhere to the particles.

It was found that tubes were best covered by caps made from glass tubing of slightly larger size than the tubes themselves.

Counting was on a haemocytometer and enumerations were reasonably accurate provided trypanosomes did not exceed about 60 to the 256 squares on the slide, i.e., about 1,000 per cmm. In the case of very heavily infected mice, a 3,000 fold dilution gave a count between 30 and 60 for the whole of the squares on the scale.

It was constantly found that death took place more rapidly in the tubes containing the larger numbers of parasites than in those containing small numbers, i.e., in the more highly diluted blood. In dilutions of 1 in 30,000 an actual increase in the number of trypanosomes during the first few hours was recorded. Dividing forms were seen.

An experiment was carried out to test whether it was the concentration of the original mouse serum or the concentration of parasites which determine this difference. This was done by washing the trypanosomes twice in fresh rabbit serum. The results showed that it was the concentration of the trypanosomes. Little is known about the metabolism of trypanosomes, but the effect of the addition of glucose in making a medium more suitable for their maintenance is recognized. The addition of 0·1 per cent. of glucose restores the nutrient properties of serum which has had large numbers of trypanosomes in it for several hours. The authors were unable to find evidence of anything toxic in serum in which trypanosomes had been kept for several hours but which had lost its capacity to maintain them. The addition of glucose restored this capacity.

Further experiments, of which details are given, coupled with chemical analysis showed that trypanosomes consume large amounts of sugar and that the length of life of the organisms depends upon the amount of sugar available.

Further experiments were carried out with a view to determining whether, after the removal of the glucose by the parasites, any further change occurred, and it was found that a condition of medium occurred which could not be completely overcome by the addition of further glucose. That is to say, that addition of glucose after a certain lapse of time did not restore the capacity of the medium to maintain trypanosomes completely. There is no knowledge of what the substance concerned in this change is, but in view of the comparative failure of artificial media to support trypanosomes, it is possibly protein.

It has been found that ox, horse, or pig serum can be used instead of rabbit serum, but it was also found that *T. rhodesiense* and *T. equiperdum* were rapidly killed by human serum in high dilutions at 37° C., while *T. gambiense* is apparently unaffected.

Experiments with media other than serum showed that serum in some proportion is essential, but that serum can be diluted with Ringer and glucose without impairing its capacity to support parasites.

MACLEAN (G.). **Stumpy and Posterior-Nuclear Forms in a Strain (Ferox) of** *Trypanosoma brucei.*—*Ann. Trop. Med. & Parasit.* 1929. Dec. 31. Vol. 23. No. 4. pp. 519–520.

The author devotes a few lines to the question of the identity of the trypanosome described by PLIMMER and BRADFORD in 1899 and called *T. brucei.* He points out that the parasite described by BRUCE in 1897 was polymorphic, while that described by PLIMMER and BRADFORD was monomorphic.

On several occasions Maclean has observed stumpy forms in the blood of mice infected with *T. brucei* (ferox) obtained from MESNIL in a guineapig sixteen months previously. Six individuals were seen with posterior displacement of the nucleus. In one of these there was no free flagellum and the nucleus was almost at the extreme posterior extremity. This parasite was found in the blood of a mouse in which trypanosomes were gradually disappearing following an administration of the anil preparation No. 71 (Browning, Cohen, Ellingworth and Gulbransen). The cytoplasm was not granular.

The five other trypanosomes were seen in the blood of a mouse which had been treated 45 hours previously with the styryl compound No. 90. Four of these were dividing forms in which the cytoplasm had not separated into two, but two nuclei were present. The other one showed the axoneme, but there was no free flagellum. The nucleus was somewhat posteriorly placed and the cytoplasm contained coarse granules.

MUKTESAR. **Report of the Imperial Institute of Veterinary Research for Year ending 31st March, 1929.**—26 pp. 1929. Calcutta: Govt. of India Central Publication Branch.

Surra.—57 naturally contracted cases of surra in horses were treated by the intrathecal injection of Bayer 205. Six died or were destroyed as a result of accidents in the application of the treatment or from causes other than surra. Three of the remainder showed trypanosomes 78, 90 and 97 days after the last injection. It is thought that these were really re-infections and not relapses.

Eighteen couples of the Delhi Hunt Hounds were at Muktesar from March 18th to October 18th. Ten of these hounds had been diagnosed as affected with surra during the previous winter, and had received treatment with Bayer 205. No recurrence of the disease occurred during their stay at Muktesar.

Piroplasmosis.—Nineteen Holstein bulls imported by the Military Department from South Africa were landed at Bombay on October 27th, 1928. Between November 11th and 24th 12 of them which had been distributed to the Northern Circle contracted theileriasis. Three died, one was severely affected, but recovered, eight had severe attacks and two of these suffered relapses two months later.

The symptoms were as follows: The disease develops suddenly with high temperature, and this is maintained. When parasites appear in the blood the temperature oscillates. The parasites increase in numbers rapidly until some 70 per cent. of the corpuscles are invaded. A single corpuscle may contain as many as ten parasites. Other symptoms

then appear, the most striking of which is profuse lachrymation. In spite of maintenance of appetite there is loss of condition.

Anaemia is pronounced, and icterus may be observed.

No medicinal treatment appeared to be of any value.

Two very noticeable lesions were found at post-mortem examinations: localized patches in the liver having a necrotic appearance, and umbilicate ulcers in the abomasum. It is believed that recovery leaves no immunity. Infected animals remain carriers, and are liable to relapses. The histological details have not been worked out, but they appear to consist essentially of lymphocyte "blocks" in the smaller arteries of the principal organs.

It is important to note that the bulls had been submitted to blood inoculation in South Africa with the object of immunizing them against *B. bigemina* and *Theileria mutans*. The theileria of the two countries would therefore appear to present marked differences of pathogenicity. The records of the immunization of these animals against rinderpest by the simultaneous method furnish no indication that they become infected with *B. bigemina*.

DU TOIT (P. J.) & VILJOEN (P. R.). **Dipping as a Method of eradicating East Coast Fever.**—*Union of S. Africa. 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 33–66.

There is evidence to show that in spite of short interval dipping and hand dressing East Coast fever persists in districts where dipping has been practised for at least several years.

A series of experiments was carried out under ordinary field conditions on an infected farm, for the purpose of accumulating more information about the effects of dipping upon ticks.

Three series of experiments are detailed, the main objects of which were:—

(*a*) To determine the preventive action which the official 5-day dipping and hand dressing had against East Coast fever in cattle exposed on a badly infected farm.

(*b*) To study the comparative results obtained from 5 and 3 day interval dipping.

At the same time observations were made on the effects of different hand dressing materials and on the value of clipping the long hairs from the ears and the brush from the tip of the tail.

For the dipping, official 3- and 5-day arsenite of soda dips were used. For the hand dressing, the official 14-day arsenite of soda strength was used and also a mixture of 1 part of tobacco (2 per cent. nicotine) and 10 parts of mineral oil.

(*c*) To carry out tests with the object of determining whether a more effective dip than that used under (*b*) could be devised.

The details of each experiment are set out in tabular forms and the following conclusions are drawn.

(*a*) Eight experiments in this series lasted for periods ranging from 12 to 36 days. A total of 127 animals were exposed to infection and 84 contracted the disease. It was thus seen that the official 5-day dipping and hand dressing (sodium arsenite or tobacco and oil, and in two experiments no hand dressing) was of scarcely any value for the control of the disease.

(*b*) There were eleven experiments lasting about four months in this group. Of 128 animals used about 61 per cent. contracted East Coast

fever. The animals were divided almost equally between the 3-day and 5-day tests, and the results were approximately the same in both groups. Additional treatment was given to animals of each group. This additional treatment involved one of the following methods of hand dressing. Tobacco and oil with clipping, arsenite of soda with clipping, clipping only, tobacco and oil only, arsenite of soda only, and 9 animals of the 3-day group were dipped only.

The best results were given by 3- or 5-day dipping together with clipping and dressing with tobacco and oil. The method is less satisfactory if the clipping is omitted.

During the experiment 16 controls were exposed on the farm and 15 of these contracted the disease.

Although dipping with clipping and dressing with tobacco and oil gave the best results, even these were far from good because only some 64 animals were protected. The conditions under which the experiment was carried out were field conditions, but the best possible field conditions.

In seeking a dip that would be more effective than the 3-day dip Pitchford's dip was tested, but it was not found to be superior to the arsenite of soda.

Experiments showed that animals which had been dipped frequently for a considerable time contracted the disease just as readily as those dipped for the first time. This appears to furnish evidence against the view that there is any considerable accumulation of arsenic in the skin.

On farms where short-interval dipping is carried out further infection of ticks takes place because the process, for a variety of reasons such as climatic conditions, poor grazing, lack of fencing, proper control of animals, cannot be carried out perfectly. Dipping is, however, absolutely essential, and it has rendered many parts of the Union fit for cattle and sheep farming which would otherwise have been useless for the purpose.

Dipping is, however, a very slow process for the eradication of East Coast fever, and the authors express the opinion that with the present very limited distribution of the disease in the Union it would pay the State better to apply other methods, such as slaughter or removal of cattle, especially in isolated outbreaks.

DE KOCK (G.). **The Relation of the Spleen to Immunity in Bovine Piroplasmosis.**—*Union of S. Africa. 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 9–14.

A summary is given of the literature bearing upon the subject of the effect of splenectomy upon protozoan and other infections.

Observations upon two animals are recorded.

Prior to the operation of splenectomy both these animals were carriers of piroplasma and anaplasma. After the operation was performed relapses to both diseases occurred. Recovery from piroplasmosis took place. About three years later one animal was inoculated with the local strains of piroplasma and anaplasma and died of acute redwater, while the other, turned out on the veldt, contracted redwater naturally and died.

The author concludes that immunity is due to antibodies elaborated by the spleen and the spleen only.

THEILER (A.) & DU TOIT (P. J.). **The Transmission of East Coast Fever by Means of Blood.**—*Union of S. Africa, 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 15–31.

The substance of this paper has appeared elsewhere, and has already been abstracted (see this *Bulletin*, Vol. 17, p. 10).

AMANSCHULOFF (S. A.), ARBUSOFF (P. N.) & SCHURAWLEFF (A.). Versuch der Behandlung der Pferdepiroplasmose mit dem Präparat 270. [**The Treatment of Equine Piroplasmosis with 270.**]—*Arch. f. Wiss. u. Prakt. Tierheilk.* 1929. Dec. 20. Vol. 60. No. 6. pp. 562–564.

Although there appear to be no references to the occurrence of equine piroplasmosis in the Ural prior to the revolution, it was known that the transmitting tick, *Dermacentor reticulatus*, occurred, and there can be no doubt that the disease actually occurred. A condition known as " sar-auru " (yellow disease), which ran a course like piroplasmosis, was known. The disease ran a benign course because animals were infected when young and susceptible horses were not introduced from other areas. Attention was distracted from it by more serious diseases. The civil war changed this, and the introduction of fresh animals drew attention to the condition. It was, however, not recognized, and only symptomatic treatment was resorted to, and this without success.

In 1925 a definite diagnosis was made, and during 1925–26 trypanblue and trypanred were tested. Trypanblue was a failure, but trypanred gave more promising results when it was used during the early stages. In cases of 5–6 days' standing it was not successful. In some cases death resulted. This shock can be lessened by an injection of camphor subcutaneously before giving the trypanred, and the latter should be given in two doses with an interval of 2–3 hours. 100 to 150 cc. of 1 per cent. solution was employed. Later a further modification was introduced of bleeding from the opposite vein while the injection is being made.

Although Fourneau 207 was found to be less effective than naganol and Fourneau 309 for the treatment of trypanosomiasis in camels, it was decided to test it on equine trypanosomiasis. Eight cases were treated, and details of four of these are given. The dose was 3 g. in 30 cc. of sterile water, given intravenously, and satisfactory results were obtained. No complications were observed, and abscess formation did not take place.

CUILLÉ (J.), DARRASPEN (E.) & CHELLE (P.). Contribution à l'étude des piroplasmoses du mouton. Premières observations de Babésiellose en France. [**Piroplasmosis in the Sheep. First Observations of Babesiellosis in France.**]—*Rev. Gén. de Méd. Vét.* 1930. Feb. 15. Vol. 39. No. 458. pp. 65–83. With 2 charts & 26 figs.

LEBLANC and SAVIGNÉ considered that a disease characterized by haemoglobinuria and jaundice which caused great losses in a flock of Southdown sheep in France in 1899 was a piroplasmosis, but they do not appear to have seen the causal organism. Towards the end of 1927 reports were received from certain districts in the south of France that a disease characterized by anaemia, haemoglobinuria and jaundice,

which ran a rapid course, and usually terminated fatally, was coming under observation. Post-mortem examination disclosed yellow discolouration of the liver with haemorrhagic areas, enlargement and congestion of the kidneys, petechiae in the small intestines, no enlargement of the spleen. At that time there was no opportunity of examining blood smears. More recently it has been possible to carry out a detailed examination.

In June, 1927, some sheep were imported into France from Poland for the purpose of producing cross-breds. Within a year all the imported animals with the exception of two ewes (i.e., two rams and eight ewes) had died from some disease, the nature of which was not determined. In May, 1929, 16 caracul rams were imported from Poland on to the same premises. Deaths began to occur again among the imported animals. Two carcases were examined forty-eight hours after death. The liver was markedly enlarged and of a yellowish colour, and showed haemorrhagic areas. The gall bladder was distended with very thick bile. The spleen was enlarged and its pulp was soft and blackish in colour. The kidneys showed cortical congestion and the bladder contained a small amount of dark brown urine. This colouration was found to be due to the presence of haemoglobin. Examination of blood smears and smears from organs failed to reveal any intro-corpuscular parasites.

Some weeks later a sick ram was brought for examination. The animal had a temperature of 41·7° C., the respirations and heart were accelerated, and the urine, which was passed in small amounts, was coffee-coloured. Examination of blood smears revealed the presence of anisocytosis and about 30 to 40 per cent. of the blood corpuscles contained parasites. On consecutive days intravenous injections of trypanblue were given, and on each occasion the injection was followed promptly by a considerable fall of temperature. Within a few hours, however, it rose again and there was marked aggravation of the symptoms, and death occurred. Post-mortem examination was carried out an hour after death. The tissues were all intensely stained blue, but otherwise lesions similar to those previously found were present.

Two further rams were sent for observation. One of these appeared to be in good health, but parasites were found in 10–15 per cent. of the red corpuscles. Trypanblue was again used, but apart from causing a fall of temperature it was without effect. In this case it would appear that, in spite of the persistent presence of parasites in the blood in large numbers and of reduction in the number of red corpuscles, there was no haemoglobinuria. The animal steadily became worse, and died on the 8th day. Before death severe diarrhoea set in.

No lesions of importance were found at the post-mortem. There was only slight enlargement of the spleen; the liver and kidneys appeared to be normal. Petechiae were present on the auricles of the heart. In blood smears taken two hours after death only anaplasma-like bodies were found in fairly large numbers. No definite statement is made as to the nature of the intracorpuscular parasites found in the blood during life.

The second of these animals appeared to be perfectly healthy until the 11th day after it had been received. Prior to this blood counts had given about 12,000,000 red corpuscles per cmm. Illness was shown by a rise of temperature, dullness, acceleration of respiration and pulse, but the urine was normal. Examination of the blood " showed fairly

numerous piroplasms, 3 to 8 per cent. of the corpuscles, practically all anaplasmoid." This animal was treated with a succession of doses of urotropine, and by the fourth day after illness had appeared parasites had disappeared from the blood and the animal had recovered normal health.

The authors give 26 figures of parasitized red corpuscles to illustrate the morphology of the organism found. Measurements indicate that the parasite is generally larger than *Babesiella ovis* described by LESTOQUARD.

Anaplasma forms are rarely encountered save when parasites are disappearing from the blood. Annular and ovoid forms are the most numerous. They measure from 1·5μ to about 3μ in their larger diameter. They seldom occupy the centre of the corpuscle, and sometimes occur in pairs. The chromatin is usually peripheral in position. Pear-shaped forms occur singly and in pairs. Some of these are definitely marginal in position, while others which are large are centrally placed. The angle between the twin forms is very variable. In some the parasites lie close beside each other, while in others they may be disposed almost in a straight line. Some of these thinner, intensely stained forms may be along the margin of the corpuscle. Similar forms were found in smears made from organ pulp obtained during life by puncture.

The morphology of the parasites differs in some respects from that occurring in Northern Africa, and the authors thought that there might possibly be a mixed infection by *Piroplasma ovis* and *Babesiella ovis*. But the failure of trypanblue to have any effect contraindicates that; forms resembling *Piroplasma ovis* persisted after that drug had been administered.

Two attempts were made to infect animals experimentally by intravenous inoculation with large doses of blood containing parasites. In one instance parasites appeared in the blood for 3 or 4 days only, and in the other the inoculation failed to infect. It is suggested that the local breeds might be " premunized " against infection. Only imported animals were affected naturally. *Rhipicephalus bursa* was found on the diseased rams.

The authors consider that their observations indicate that ovine babesiellosis occurs in France and that examination of the blood in cases where suspicious symptoms are observed will reveal that the disease is more common than is generally supposed.

LECLAINCHE (E.). Un foyer d'anaplasmose en France. [**A Centre of Anaplasmosis in France.**]—*Rev. Gén. de Méd. Vét.* 1930. Feb. 15. Vol. 39. No. 458. pp. 83–85.

For many years bovines for export to Brazil or Madagascar have been vaccinated against anaplasmosis in Paris.

There seemed to be no danger from the sanitary point of view attaching to this operation, because it is generally agreed that the transmitting ticks are not found north of latitude 42. During the second half of October, 1929, several cases of anaplasmosis were detected among animals which were with bovines vaccinated (or premunized) in 1928 or in June and July, 1929, in Manche and Calvados.

The disease broke out at intervals of a few days on six farms containing premunized animals. 29 died, 72 were ill, and of these 43 were

slaughtered *in extremis*. As premunized animals remain carriers of anaplasms for an indefinite period it must be supposed that they had been able to infect a proportion of the animals living with them. It was thought by BRUMPT, who premunized the animals, that the infection had been carried by ixodes occurring in the district, and that it was due to ticks infected during 1928 and spread over the pastures. He did not think that there would have been time for infection to have taken place through the medium of ticks infected during 1929.

This was a disquieting state of affairs. It appeared that it would be extremely difficult to destroy the ticks. As a first step a " standstill " order was issued.

An enquiry immediately elicited the following information. The disease had occurred exclusively in herds which had received intravenously a pretended vaccination against foot-and-mouth disease. No cases occurred where this vaccination was not carried out.

At first it was thought that the blame might rest on the vaccine. There were grounds for thinking that a minority only of the animals injected with the foot-and-mouth vaccine had become infected. The majority escaped. Further, the vaccine was used without accident on hundreds of animals on premises where there were no animals which had been premunized against anaplasmosis.

The apparently paradoxical conclusion was arrived at that the infection was due to the vaccination without the vaccine itself being incriminated.

Details furnished to investigators allowed the mechanism of the infection to be discovered. The anti-foot-and-mouth vaccination was carried out in the following way : Several 50 cc. ampoules of liquid were poured into a container from which the operator filled his syringe. An aggravating circumstance was the fact that a 10 cc. syringe was used for giving 20 cc. doses, which meant that the syringe had to be dipped twice in the liquid for each animal. The needle of the syringe being left in the vein, the nozzle of the syringe, and possibly also the fingers of the operator, became soiled with blood. Assistants stated that the " liquid became red " after the syringe had been filled several times. This explains how it came about that a number of animals were infected at the same time, and the seriousness of the disease. The animals, in fact, received intravenous injections of diluted anaplasmosis blood. This explanation was supported by the fact that cases occurred only among the animals inoculated only after one premunized against anaplasmosis had been done.

It can therefore be considered that no permanent centre of infection has been produced. It was actually a case of experimental infection and not natural transmission.

YOUNG (B. P.). **A Quantitative Study of Poultry Coccidiosis. With Data on the Prepatent and Patent Periods in the Life Cycle of** *Eimeria avium*.— *Jl. Parasitology*. 1929. June. Vol. 15. No. 4. pp. 241–250. With 1 text fig.

The writer worked with a parasite which he states was *E. avium*.

He found that the interval elapsing between the ingestion of oocysts and the appearance of oocysts in the faeces was a few hours less than four days. He also found that unsegmented oocysts ingested a few

hours after having been voided by the host may produce infection, while if the interval of exposure to air is 12–18 hours before the oocysts are ingested there is very likely to be infection.

The observation that exposure to air is necessary for sporulation is confirmed.

If re-infection is prevented the disease will run a rather limited course, and experimental infection later does not seem to promote immunity.

The author found by measurements that apparently two coccidia were present in some infections and thinks that they may have been *E. avium* and *E. tenellum.* In one case there was some evidence that leg paralysis may be due to chronic coccidiosis.

TYZZER (E. E.). **Coccidiosis in Gallinaceous Birds.**—*Amer. Jl. Hyg.* 1929. Sept. Vol. 10. No. 2. pp. 269–383. With 9 plates (2 coloured) & 2 text figs.

It has been generally assumed that *Eimeria avium* is widely distributed in many species of birds, but the author brings evidence to show that a single host, such as the chicken, may harbour a number of species of eimeria. In view of the fact that these possess characters which do not intergrade, it appears to be preferable to regard them as different species.

A review of the literature reveals the fact that *Eimeria avium* is not a valid species, and that *E. tenella,* Railliet & Lucet, causes disease of the caeca.

Three new species of eimeria from the chicken are described and named *E. mitis, E. acervalina* and *E. maxima.* The chicken also occasionally harbours a coccidium of the genus *Cryptosporidium* which is regarded as *C. parvum* found originally in the common mouse. Two species of coccidium are found in the turkey, *E. meleagridis* and *E. meleagrimitis.* The latter is a provisional species, as the organism closely resembles *E. mitis* of the chicken. The pheasant harbours two species, *E. phasiani* and *E. dispersa.* What appears to be a variety of the latter occurs in the quail. There appears to be a high degree of host restriction with these species, and cross infection experiments may be required to determine it.

In differentiating the species referred to, a number of factors have been taken into consideration: Morphology, distribution in the intestinal tract, time required for development and sporulation of the oocysts, and the reaction of the host. All are parasites of the intestinal epithelium, but in the case of *E. tenella* the invaded cells become phagocytic and actively invade the underlying tissue, producing a condition resembling a new growth, but there is no cell division as in cancer.

The more pronounced pathological changes occur in association with forms which penetrate deeply and attain a large size. In the case of *E. tenella* it is the large schizonts which are concerned in the haemorrhage from the mucous membrane. In the case of *E. maxima* the asexual forms are small and produce little injury, but the gametocytes are very large and are responsible for the haemorrhagic exudate and for the thickening of the wall of the intestine.

The mere detection of oocysts in the faeces is not sufficient to warrant an opinion that coccidiosis is the cause of illness or death, because it has

slaughtered *in extremis*. As premunized animals remain carriers of anaplasms for an indefinite period it must be supposed that they had been able to infect a proportion of the animals living with them. It was thought by BRUMPT, who premunized the animals, that the infection had been carried by ixodes occurring in the district, and that it was due to ticks infected during 1928 and spread over the pastures. He did not think that there would have been time for infection to have taken place through the medium of ticks infected during 1929.

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The mere detection of oocysts in the faeces is not sufficient to warrant an opinion that coccidiosis is the cause of illness or death, because it has

been found that certain species are only pathogenic when present in large numbers and for a long time. The detection of the lesions is of greater importance.

The developmental phases in the host are governed by inherent or cyclical influences rather than by any protective reaction on the part of the host. With continued re-infestation all stages of development may be found at one time. The time required for the cycle of development is characteristic for each species.

Although it is stated that the developmental phases are governed by cyclic influences rather than by protective reaction, immunity is said to develop more promptly with *E. maxima* and *E. tenella* than with the others. These two species penetrate the tissues more deeply and are more frequently retained and absorbed.

With regard to control, the author finds that the use of milk or milk sugar as outlined by BEACH & DAVIS (1925) may not only be injurious to the chickens, but cannot be relied upon to prevent or diminish coccidial infection. Skim milk in excess fails to prevent infection and may cause loss of feathers.

In the control of the infections certain factors should be borne in mind. The severity of infection depends upon (1) the species concerned, (2) the number of oocysts being ingested, and (3) the presence or absence of immunity.

The question arises as to whether it is wise to attempt to exclude infection. While it is impossible to accomplish this for the entire period of growth, young birds may be kept free for long periods. Increased age, of itself, furnishes no increased resistance, and it may be a greater loss to lose larger birds than small ones, as a result of infection at a later stage of growth.

It would appear that the general aim should be to limit the dosage as much as possible without attempting to prevent infection.

The original paper must be consulted for details of the individual parasites and their cycles of development.

PACHECO (G.) & PENHA (A. M.). Verificação da *Eimeria faurei* (Moussu et Marotel, 1902) e sua frequencia em caprinos de São Paulo. [**The Discovery of *Eimeria faurei* in Goats in São Paulo, and the Frequency of Occurrence of the Parasite.**]—*Revista Soc. Paulista Med. Vet.* 1929. Nov.–Dec. Vol. 1. No. 1. p. 7. With 1 plate. English summary (7 lines) pp. 7–8.

The authors report the detection of *E. faurei* in 82 per cent. of native goats and in 58 per cent. of 36 goats imported from Europe for the Animal Exhibition in São Paulo in June, 1929.

PENHA (A. M.). A *Eimeria zürnii* (Rivolta, 1878) como causa de coccidiose bovina no Brasil. [*Eimeria zürni*—**a Cause of Bovine Coccidiosis in Brazil.**]—*Revista Soc. Paulista Med. Vet.* 1929. Nov.–Dec. Vol. 1. No. 1. pp. 2–4. With 2 plates. English summary (6 lines) p. 4.

The author reports—for the first time—coccidiosis of a bovine in Brazil due to *E. zürni*. Two plates illustrating the parasite and the lesions in the large intestine are given.

HUFF (C. G.). **The Effects of Selection upon Susceptibility to Bird Malaria in *Culex pipiens* Linn.**—*Ann. Trop. Med. & Parasit.* 1929. Dec. 31. Vol. 23. No. 4. pp. 427–442. With 2 plates & 2 text figs.

This paper is a study of parasitism from the biological standpoint only, and aims at explaining the cause and nature of specificity. For details of the technique employed the paper must be consulted in the original.

The work has produced evidence that there probably exist susceptible and non-susceptible races of *Culex pipiens* as regards *Plasmodium cathemerium*.

Selection of progenies from infected mothers caused the number of infected individuals in a particular line to increase rapidly in percentage. Selection from uninfected mothers caused a rapid decrease in the percentage of infected individuals in such a line.

"It is believed that this proof weakens somewhat our conception that specificity is immutable. The proof that susceptibility and non-susceptibility behave as hereditary characters within a species opens the question whether a so-called susceptible species may not be capable of engendering a non-susceptible race, and, conversely, the question—even more important—of whether a so-called non-susceptible race may not be able to produce a susceptible race.

YAKIMOFF (W. L.) & RASTÉGAIEFF (E. F.). Epizootie de spirochétose des poules à Piatigorsk (Nord du Caucase). [**Epizootic of Avian Spirochaetosis at Piatigorsk (Northern Caucasus).**]—*Bull. Soc. Path. Exot.* 1929. Nov. 13. Vol. 22. No. 9. pp. 764–765.

The authors record the occurrence of spirochaetosis in poultry and note that they have not observed "Balfour bodies" (*Aegyptianella pullorum* Carpano, 1929).

They have obtained good results in treatment with atoxyl and German stovarsol. Russian stovarsol (orsalan) is more toxic. A Russian bismuth compound, Bijochinol, possesses neither curative nor protective properties. Béloglasoff's compound, Bi-natrium-bismuthum citro-piro-boratum, is inferior to atoxyl and osarsol. Only a few experiments have been carried out with ichthargan and albargine.

Chicks have been immunized by the simultaneous injection of virulent blood and drugs, and by the injection of mixtures of these (no details are given)

KLARENBEEK (A.). Infection oculaire expérimentale du lapin par le *Spirochaeta cuniculi*. [**Experimental Ocular Infection with *Spirochaeta cuniculi*.**]—*Ann. Inst. Pasteur.* 1930. Feb. Vol. 44. No. 2. pp. 201–207.

DISEASES DUE TO METAZOAN PARASITES.

SEDDON (H. R.) & ROSS (I. Clunies). **Observations on the Treatment of Parasitic Gastro-Enteritis in Sheep.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 62–85.

In the Southern Australian States infestation with *Ostertagia* sp. and *Trichostrongylus* spp. is more constant than with *H. contortus*, but the latter is of great importance at least in New South Wales and in Queensland.

It appeared desirable to test the efficiency of anthelmintics in single doses for obvious reasons. Naturally infested sheep were used, and this, of course, introduces some amount of uncertainty into the interpretation of results, but uncertainty is not eliminated in experiments in which animals are infested experimentally, as it has been shown that batches of animals given equal doses of larvae by no means develop the same degree of infestation.

The experiments detailed in this paper were begun in 1926, and a very large part of the paper is occupied by tabular statements of the experiments carried out involving preliminary treatment of animals (fasting or not), various anthelmintics given in varying doses, etc. These tables do not lend themselves to abstraction, and they must be referred to in the original for detailed information.

" To determine the efficiency of the treatments all sheep were killed 5 to 10 days after drenching, and the residual infestation determined. Control sheep untreated were killed at the same time, so that comparison might be made between the treated and untreated. The abomasum and the first 6 inches of the duodenum are tied off and removed. The organ was opened lengthwise and the contents washed out into a dish. The whole mucous membrane was then scraped with a spatula, as it was found that most of the worms adhered to it, into another dish. The contents were then broken down with water and allowed to sediment. Finally, examination of small quantities was carried out in glass dishes until the whole had been examined. The worms were collected and enumerated. It is not claimed that every worm was collected, but it was considered that the results obtained give a reasonable indication of the proportion of those worms present."

The authors express their results as percentages of efficiency basing the figures on the number of worms found at the post-mortem examination of the animals treated and those found in a similar number of untreated controls. In the great majority of the experiments the number of sheep treated did not exceed four, but in several of them only one or two were used. On these grounds the authors found that the efficiency of copper sulphate, copper sulphate and mustard, tetrachlorethylene, and carbon tetrachloride ranged from 8 to 99 per cent., but the percentage efficiency is given as below 67 in only 3 experiments out of 24.

With regard to the small trichostrongyles the authors state that " the figures given are those for Ostertagia, which is the most important of the smaller strongyles. The figures for trichostrongylus are generally parallel." The same drugs or combinations of drugs gave a very similar series of results with this parasite.

The authors conclude :—

(1) That copper sulphate and mustard and carbon tetrachloride are both " good methods " and with suitable doses an efficiency of about 75 per cent. may be obtained. But even with large doses there is liable to be variation amongst animals given the same dose.

The dose of carbon tetrachloride is given as ranging from 1 to 5 cc., and that of copper sulphate and mustard 7¼ grs. (presumably grammes) of each for lambs of 30–40 lb.

Tetrachlorethylene in doses of 2½ to 5 cc. appears to give satisfactory results against *H. contortus*, but less satisfactory with the smaller trichostrongyles.

Starving appears to favour the action of copper sulphate and mustard, but it does not appear to be necessary when carbon tetrachloride is used.

The doses of copper sulphate and mustard appear to be safe, but there is no information as to larger doses. While 1 cc. of carbon tetrachloride is generally safe for sheep, even this dose has sometimes caused serious losses.

Emphasis is laid on the desirability of giving more than one treatment for the double purpose of further reducing the number of worms originally harboured and for destroying those picked up after treatment.

CROVERI (P.). Un nuovo strongilide: *Anthostrongylus somalilensis* Croveri 1917 (n.g.n.s.). Parassita dei dromedari somali e la Strongilosi intestinale epizootica dei dromedari: Ber Cursu. [**A New Strongyle : *Anthostrongylus somalilensis* Croveri 1917 (n.g., n.s.). Parasite of the Somali Dromedary and Epizootic Intestinal Strongylosis of the Dromedary : Ber Cursu.**]—*Arch. Ital. Sci. Med. Colon.* 1929. Apr. 1. Vol. 10. No. 4. pp. 145–170. With 12 figs. and one key of classification. English summary (8 lines) p. 171.

The author figures and describes a new parasite which he considers to be responsible in part, at least, for the disease known as Ber Cursu in Somaliland. In a tabular key he gives the distinguishing features of the 12 genera comprised in the Metastrongylidae. The following are taken from the key to Anthostrongylus: Integument shows 12 longitudinal ridges, the mouth has 3 lips, the caudal pouch is campaniform and notched anteriorly to produce 3 lobes, the spicules are very long, 1,080 μ. The males measure 9–10 mm. and the females 14–17 mm. The vulva is near the posterior extremity just in front of the anus.

CROVERI (P.). Filariosi ematica nei bovini somali. [**Microfilariasis of Bovines in Somaliland.**]—*Arch. Ital. Sci. Med. Colon.* 1929. July 1. Vol. 10. No. 7. pp. 317–327. With 1 coloured fig. English summary (2 lines) p. 327.

The parasite is *Filaria labiato-papillosa*, and it does not appear to cause any evidence of disease.

BAUDET (E. A. R. F.). De indirecte ontwikkeling van *Strongyloides westeri* Ihle. [**The Indirect Development of *Strongyloides westeri* Ihle.**]—*Tijdschr. v. Diergeneesk.* 1930. Jan. 1. Vol. 57. No. 1. pp. 1–14. With 5 text figs. English summary p. 14.

The author detected the free living form of this parasite, which was not previously known, by faecal cultures from two foals. Moist faeces kept at 26–28° C. proved to be the best medium.

Auto-infection cannot occur because larvae are not found in fresh faeces, but only eggs.

NOTO-SOEDIRO (R.) & IHLE (J. E. W.). Ueber das Vorkommen von *Gaigeria pachyscelis* R. et H. (=G. Smiti Noto-Soediro) im Indischen Archipel. [**The Occurrence of *Gaigeria pachyscelis* R. & H. in the Indian Archipelago.**] —*Zent. f. Bakt.* I. Abt. Orig. 1929. July 30. Vol. 113. No. 3/4. pp. 204–205.

BACTERIAL DISEASES.

WOODRUFF (H. A.) & OXER (D. T.). **Caseous Lymphadenitis. Paper 1. An Experimental Inquiry as to the Common Modes of Natural Infection in Sheep.**—*Australian Vet. Jl.* 1929. Dec. Vol. 5. No. 4. pp. 130–134.

Examination of carcases at abattoirs shows that the lesions occur, in order of decreasing frequency, in the prescapular and prefemoral glands, lungs and associated glands, parotid and pharyngeal glands, and mesenteric glands. The incidence increases with age, and sexes are about equally affected. In addition to investigations designed to elucidate the natural method of infection attempts were made to find a reliable serological test, in order that the freedom of experimental animals from infection might be established. The latter experiments were not pursued.

The organism isolated from all cases was the Preisz-Nocard bacillus, but strains varied as regards toxin production. Subcultivation tended to reduce toxin production, and the most vigorous growth was obtained in broth at pH 8·13. Local strains produced acid, but no gas with maltose, glucose and dextrin, less strongly with galactose and saccharose, and not at all with lactose, laevulose, raffinose, and marmite. A French strain produced acid with laevulose. Details of experiments in which attempts were made to infect lambs by the mouth, by the umbilicus, and via wounds in various positions are given. Animals were subjected to post-mortem examination at varying intervals.

Lambs from 1 to 10 days old developed glandular lesions when infected by various paths with a not very virulent strain of the organism. Dry and apparently healed and unhealed umbilicuses were painted with culture and infection occurred.

Two lambs over 10 days old received massive doses per os. These developed only minor lung lesions.

Lambs infected through wounds always developed caseous lesions, those following castration and docking being the most severe. In several cases foci developed in distant joints. Infected splinters placed under the skin caused the development of lesions in the regional glands. Taking into consideration the relative freedom from the disease of lamb carcases at the abattoirs and the demonstrable ease of infection of lambs by wound inoculation, the authors feel that it is safe to conclude that wound infection (other than shearing wounds) is not a serious material factor in the prevalence of lymphadenitis in sheep.

WOODRUFF (H. A.) & GREGORY (T. S.). **Caseous Lymphadenitis. Paper 2. Observations on the Age and Sex Incidence in an Infected Flock in Relation to Possible Routes of Infection.**—*Australian Vet. Jl.* 1929. Dec. Vol. 5. No. 4 pp. 134–139.

The opportunity offered to carry out observations on a heavily infected flock at and subsequent to shearing.

From an economic point of view the disease has little direct interest for the owner. No mortality is recognized as being the result of the disease.

A general idea, but not an accurate estimation, of the prevalence of the infection was obtained by the examination of the superficial glands

of groups of animals as they came from the shearing shed. About 200 animals of each age were examined.

Among the lambs no infection was detected. Ewes a year old showed 5·8 per cent. affected, and of these 9 per cent. had suppurating lesions. Of 2-year-old wethers 27·0 were affected, with 11 per cent. showing suppurating lesions. Among 3-year-old wethers the figures were 39·0 and 10 per cent. respectively. Among 4-year-old wethers the figures were practically the same. Of 5-year-old ewes 30·5 per cent. were affected, with 9 per cent. showing suppuration. Among 6-year-old ewes 30 per cent. were again found infected. Of rams 10 per cent. were recognizably affected. Note was taken of the cuts and abrasions shown by animals leaving the shearing shed, and it was noted that these were particularly numerous about the fold of the flank and the neck and shoulders. Cuts on all legs were very numerous. Each animal had an average of about 100 cuts, and as many as 20 pieces of skin of appreciable size had been cut away. Animals with wrinkled skins such as merinos suffer more than the smooth-skinned animals from shearing wounds.

The authors briefly discuss possible methods of minimizing the incidence of the disease, but there are great practical difficulties in the way of applying them. Generally speaking, the shearing of animals in order of increasing age appears to be indicated.

SEDDON (H. R.), BELSCHNER (H. G.), ROSE (A. L.) & BLUMER (C.). **Further Observations on the Method of Infection in Caseous Lymphadenitis of Sheep.**—*Australian Vet. Jl.* 1929. Dec. Vol. 5. No. 4. pp. 139–148.

This paper is an amplification of the preceding one.

MCGRATH (T. T.). **On the Presence of the Bacillus of Preisz-Nocard in Infected Shear-Cut Wounds in Sheep.**—*Australian Vet. Jl.* 1929. Dec. Vol. 5. No. 4. pp. 148–149.

From four samples of pus or scab from infected shear wounds the Preisz-Nocard bacillus was isolated by guineapig inoculation in three instances.

PAIREMAURE (O.). Etude expérimentale sur la morve. Nouvelles relations entre la morve et la melioidose. [**Experimental Study of Glanders. New Relationship between Glanders and Melioidosis.**] —*Thèse Vétér.* Paris. 1929. ex. *Bull. Inst. Pasteur.* 1929. Aug. 31. Vol. 27. No. 16. p. 726.

In animals which give a doubtful reaction to mallein a second dose may be given subcutaneously with advantage. The injection should be given in the morning and the reaction examined the same day. The reaction occurs more rapidly with the second dose.

The serum from a glandered horse fixes complement to the same extent with an antigen of *B. whitmorei* as with one of *B. mallei*. Similarly, a glandered horse reacts to the intradermal injection of 0·1 cc. of an extract of culture of the paraglanders bacillus, and also to the subcutaneous injection of 2 cc. of the same extract. Like reactions following the injection of mallein, they are systemic and local. Injection of a healthy horse produces no reaction.

VERGE & PAIREMAURE. Les réactions de l'organisme équin à la whitmorine. [**The Reactions of the Equine to Whitmorine.**]—*Rev. Gén. de Méd. Vét.* 1930. Jan. 15. Vol. 39. No. 457. pp. 17–19.

The authors use the name whitmorine to designate a material prepared from *B. whitmori* on the same lines as mallein.

Cultures are grown for five weeks in glycerin Martin's broth (pH 7·4). They are then autoclaved at 115° for 30 minutes and then centrifuged. The supernatant liquid was decanted aseptically and used for subcutaneous and intradermal tests without any further manipulation of any kind.

In healthy horses the intradermal injection of 0·1 cc. of whitmorine produces only a fugitive painless swelling of small size.

In glandered horses a similar injection into the skin of the lower eyelid produces a hot painful oedematous swelling which makes its appearance about the 4th hour and increases up to the 11th hour. Both eyelids become involved and muco-purulent material collects at the inner canthus. The oedema is slowly re-absorbed and disappears about the 30th hour.

Intradermal injection produces a painful oedematous swelling from the 5th hour, with cording of the lymphatics. This reaction persists until the 36th hour.

A second injection at the same place at the 48th hour produced a similar but less marked reaction. Subcutaneous injection of 2 cc. produced a hot painful local reaction measuring 16 centimetres, which disappeared slowly. This reaction occurred rather later than a reaction to mallein ordinarily does. There was a rise of temperature from 37·7° C. to 39·1° at the 15th hour. The animal showed pronounced prostration and loss of appetite.

It is clear, then, that whitmorine produces distinct reactions in glandered horses, but it is a remarkable fact that while human beings affected with melioidosis react to mallein, the only case of spontaneous melioidosis in a horse so far known gave no reactions when tested with mallein.

WIGMORE (J. B. A.). **Note upon the Production of Brucella Agglutinins.**—*Jl. Roy. Army Med. Corps.* 1930. Jan. Vol. 54. No. 1. pp. 5–10.

The author points out the divergences in view which have been expressed by a number of investigators regarding the means of distinguishing *B. abortus* and *B. melitensis.* He believes that the smallness of the number of cases reported in this country is due to difficulties of diagnosis. He thinks it possible that a serum from a case of undulant fever, or more definitely from an artificially immunized rabbit, may fail to agglutinate all strains of either the homologous or heterologous species of the Brucella group. The practical result of this from the point of view of the laboratory worker may be twofold :—

(*a*) A serum from a case of undulant fever may fail to agglutinate any of the three suspensions made from the available strains of melitensis, paramelitensis, or abortus.

(*b*) Should the infecting organism have been recovered from the patient, this may fail to be agglutinated by antiserum of melitensis, paramelitensis, or abortus.

Since the percentage of cows infected with abortus is high, it seems logical to assume that a fair number of people should become infected. As the number of diagnosed cases of undulant fever is very small, it would seem that greater facilities for more accurate diagnosis are of importance.

In the author's laboratory work was undertaken with all the available strains of the Brucella group in an attempt to find :—

(1) An anti-serum that would agglutinate all the strains of the group.

(2) Three anti-sera which would agglutinate all the strains of melitensis, paramelitensis, and abortus respectively.

(3) A strain from which a suspension could be made which would be agglutinated by all sera of Brucella-group infections.

(4) Strains of melitensis, paramelitensis and abortus of which suspensions could be made which would each be agglutinated by all antisera of their homologous species.

A number of rabbits were inoculated with the following strains :—

(*a*) Melitensis Oxford (Caprini), melitensis W.P.R.L.S.8, melitensis Zammit, melitensis " D."

(*b*) Paramelitensis Bassett-Smith, paramelitensis 2065, paramelitensis Ch. 83.

(*c*) Abortus No. 8 (Bang), Abortus Swine, Abortus Oxford (Bang).

The antigens were 48–72-hour cultures in trypsin broth killed by the addition of " 2 drops of 40 per cent. formalin " to the test tube. Sterility was tested for on the following day.

Increasing doses, 0·2, 0·5, 0·75 and 1 cc. of these were injected intravenously into rabbits at intervals of 5 days. Blood was taken 5 days after the last injection.

The cultures used for agglutination were broth cultures killed by the addition of " 40 per cent. formalin " so that the final concentration was 0·2 per cent. These were adjusted as nearly as possible to the opacity of the standard agglutination suspensions of melitensis and abortus issued by the Standard Laboratory of Oxford University, but some growths were too feeble to reach this standard. After referring to the findings of other investigators regarding alterations of agglutinability following dilution of the antigen, the author states that he " did not find that dilution increased their agglutinability after they were made to correspond with the Oxford suspensions. Dreyer's technique was used, incubating for 4½ hours at 55° C. No dilutions lower than 1/125 were used because of the tendency of the group to show agglutination only in high rather than in low dilutions.

The results of the tests are given in tabular form and from these it is concluded :—

(1) That sera from human cases of infection show greater agglutinating power than sera from rabbits immunized with killed cultures.

(2) None of the rabbit sera was capable of agglutinating all the strains of melitensis, paramelitensis, or abortus.

(3) No strain was agglutinated by all the antisera, but certain strains were agglutinated by all the homologous antisera.

It is noted, however, that the agglutinability of cultures is not a constant feature. Different cultures of the same strain may agglutinate to different titres with the same serum. The author found that the serum of a rabbit immunized with a particular strain may fail to agglutinate that strain, while agglutinating other strains of the same species or allied species. It therefore appears that a serum prepared

with a killed strain may fail to agglutinate an organism isolated from a human case of clinical undulant fever.

The author considers that possibly the use of stock cultures had some influence upon the results, and also that killing by heat might also have been a factor, and he has begun using living cultures for the immunization of the rabbits for future experiments.

EDGAR (G.). **On the Occurrence of Black Disease Bacilli in the Livers of Normal Sheep. With Some Observations on the Causation of Black Disease.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 18–26. With 1 plate

The author briefly discusses previous work regarding the organism isolated from the necrotic foci in the liver in cases of black disease, and concludes that is a variant of *B. oedematiens*.

Pieces of normal sheep's liver weighing 10 to 20 grammes were removed with all precautions to prevent contamination, were placed in sterile jars and incubated at 37° C. for 24 hours. Cultures were then made in sheep's heart medium.

It has been found that the bacillus of black disease withstands 100° C. for 16 minutes; the cultures prior to incubation were therefore heated to 100° C. for 7 minutes to kill off other organisms which might have been present in the liver.

The author quotes authorities regarding the presence of bacteria in apparently healthy organs. The author tested the growths obtained by inoculating guineapigs with culture and with culture and oedematiens serum. Proceeding in this way it was found that the bacillus of black disease could be recovered in some cases from the livers of healthy sheep. Out of 87 sheep *B. oedematiens* was found in 6, diplococci in 32, staphylococci in 11, streptococci in 7, " large bacilli " in 29, and 26 were sterile. These organisms were sometimes present as mixtures.

B. oedematiens was found in material from the Southern Tablelands, and from this part of the State 24 per cent. of the livers showed it. The disease is enzootic in this district.

Other authors have noted the coincidence of black disease with fluke infestation. The author found no such infestations, but stomach and intestinal parasites were present.

Present information shows that the disease occurs in the southern part of the State, but evidence is accumulating that it is spreading northwards.

Black disease bacilli have been recovered from the soil in the enzootic area, and the author considers that invasion of the liver takes place from the intestine, the bacilli gaining access either to the portal blood direct, or indirectly to the blood stream via the lymphatics.

Although the author found no evidence of fluke infestation in the livers of the apparently healthy animals from which he recovered the bacillus, he considers that the damage done to the liver tissue by young flukes plays an important part in the production of the disease.

EDGAR (G.). **An Inquiry into the Etiology of Blackleg in Calves in New South Wales.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 27–35.

Investigations carried out in New South Wales with materials from eight outbreaks show that the causal bacillus was *B. chauvoei*. Only

those cases were considered as blackleg in which there was fever, lameness, and " muscle tumour." The author emphasizes the extreme importance of obtaining material for examination within a short time of death, particularly in hot weather. Reliance is not to be placed upon results with materials obtained after the lapse of more than a few hours.

The disease is not widespread in New South Wales, but appears to be limited to the coastal strip.

The author refers to the work of McEwen on the subject, but spells the name incorrectly (McEwan) throughout his text and in his list of references.

Parker (R. R.), Brooks (C. S.) & Marsh (H.). **The Occurrence of** *Bacterium tularense* **in the Wood Tick,** *Dermacentor occidentalis*, **in California.**—*Public Health Rep.* 1929. May 31. Vol. 44. No. 22. pp. 1299–1300.

The recent occurrence of an unrecognized pathological condition in cattle heavily tick-infested in California has resulted in the demonstration of natural tularaemia infection in adults of the Pacific Coast tick, *Dermacentor occidentalis*, Hewmann. This tick has been reported on horses, cattle, deer, dogs, sheep, rabbits, and man. The disease was detected in two groups of cattle brought to California from other parts of the country. Both batches were observed to be affected 10 days after they had been turned out on a tick-infested range. The animals showed typical tick paralysis and several died. The local cattle were not affected, nor were some of the imported batches which were not turned out and were not tick-infested.

Ticks and serum were obtained from one animal which had been down a few hours. The animal got up and walked away half an hour after removal of the infesting ticks. The ticks were dead when they were received at the laboratory, but of six guineapigs injected two died in 4 and 10 days after injection, showing lesions indicative of tularaemia Twenty-nine guineapigs were used in two series of transfers from the two original guineapigs and all of these died of acute tularaemia except one. Cultures from the spleens produced typical lesions in guineapigs and were agglutinated with tularaemia-immune human serum.

The serum of the bovine (a steer) agglutinated *B. tularense* and *Brucella abortus* completely at 1 : 10 and 1 : 20, and partially at 1 : 40. Another sample of serum from an affected steer, which four months later had failed to recover normal condition, agglutinated *B. tularense* up to 1 : 40 and partially at 1 : 80, and *B. abortus* at 1 : 10 and 1 : 20.

Hall (I. C.). **The Occurrence of** *Bacillus Sordellii* **in Icterohemoglobinuria of Cattle in Nevada.**—*Jl. Infect. Dis.* 1929. Aug. Vol 45. No. 2. pp. 156–162.

The author records the occurrence of *B. sordellii* in cases of icterohaemoglobinuria of cattle in Nevada. The two strains isolated are considered to be secondary invaders, the primary cause of the " redwater " being *Bacillus haemolyticus*.

B. haemolyticus resembles *B. sordellii* in its vegetative morphology and gram-staining reaction, its sluggish motility, its fermentation reactions, with the exception of maltose, and its action on gelatin.

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B. haemolyticus resembles *B. sordellii* in its vegetative morphology and gram-staining reaction, its sluggish motility, its fermentation reactions, with the exception of maltose, and its action on gelatin.

It differs in its sparse production of spores in old cultures, its weaker proteolytic action, its failure to ferment maltose, its haemolytic action on blood, its marked tendency to produce congestion in animals, and in the specific antigenicity of its soluble toxin.

NEIVA (C.). Sobre a presença de salmonellas em bovinos sãos. [**The Presence of Organisms of the Salmonella Group in Healthy Bovines.**] —*Revista Soc. Paulista Med. Vet.* 1929. Nov.-Dec. Vol. 1. No. 1. pp. 5–6. English summary (7 lines) p. 6.

The author detected 9 animals out of 226 examined in the faeces of which salmonellas were present; in six cases the agglutination titre of the serum was 1 in 640, in two, 1 in 1,280, and in one, 1 in 5,120.

MYCOTIC DISEASES.

SEDDON (H. R.). **Mycotic Dermatitis of Sheep.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 10–17. With 3 plates.

This condition is one in which the wool becomes matted together and can be pulled from the skin in tufts of varying size. In bad cases the whole of the back, shoulders, and loins may be affected.

Examination of the crusts and scabs shows that they contain a mycelium. It is said that if the scabs are boiled in 10 per cent. caustic potash the mycelium can be detected more readily. The organism can be stained by gram or by toluidine blue. With the latter coccoid bodies can be found deeply stained in the mycelial threads; the ensheathing material is stained pinkish. Gram followed by dilute basic fuchsin produces a parallel result.

Experiments showed that the condition is readily transmitted, even though the area of skin to which the infective material is applied be not shaved, but only clipped. Sections cut from a five-day-old lesion experimentally produced show that the mycelium penetrates the wool follicles.

Spontaneous recovery apparently takes place, because cases have been seen in which the outer ends of the wool fibres are matted together, the wool nearer the skin and the skin itself being healthy. Such scabs contain the mycelium and are capable of causing infection. Scabs kept at room temperature for a year are still capable of infecting, and are possibly infective for longer periods. The condition is not associated with any irritation. The stages of development of the lesions are: Hyperaemia, crust formation, detachment of scabs. During the hyperaemia stage the skin is swollen and tender. Crust formation begins after about a fortnight, and as the crusts increase in thickness they assume the form of a series of pyramidal projections. This stage lasts about three weeks.

If the scabs are torn off before natural separation occurs a raw granulating surface is exposed. If left to become detached naturally, the skin is found to be covered with a rather scaly-looking epithelium. Cases have not been observed for a sufficient length of time to warrant any statement regarding the reappearance or not of wool over these areas.

Microscopic examination of sections shows that the mycelium surrounds the wool in the follicle near the orifice of which it forms a felted mass. The mycelial elements lie in a matrix which stains faintly and which at the surface of the skin contains leucocytes. The scabs show a laminated structure, and they contain numerous rounded or oval masses which show centrally a wool fibre surrounded by a mycelial layer, and external to this a leucocyte layer. These have evidently been extruded from follicles.

In the early stages there is congestion of the vessels below the malpighian layers, some extravasation of leucocytes, and marked multiplication of fibroblasts. The separation line between the scab and the epithelium is marked by vacuolation of the surface epithelium.

The disease tends to run a shorter course in shorn sheep than in unshorn animals, and experiments (not yet completed) appear to indicate that the greater amount of moisture in the long wool plays some part in this. Rain affects the course of the disease for the same reason, and there seems to be no doubt that it is this fact which has lead to the use of the term " rain rot."

The authors have not been able to cultivate the parasite as yet, and consequently have not been able to identify it. It would appear to be different from those already described as occurring in sheep.

In a single experiment the authors produced a scab-like lesion in a calf, but they do not state whether they found the parasite or not.

The treatment of the disease is under investigation. The authors think it unlikely that the dips used for the control of melophagus and lice will be able to affect the parasite under the hard scabs.

DISEASES DUE TO FILTERABLE VIRUSES.

SEDDON (H. R.) & BELSCHNER (H. G.). **Infectious Labial Dermatitis or " Scabby Mouth " in Sheep and Goats.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 36–44. With 5 figs. on 2 plates.

The authors summarize the views which have been expressed regarding the nature of the infection in so-called " scabby mouth " in sheep and goats, and state that they have come to consider the disease as being due to a virus of the vaccinia-variola group. This view has been expressed by THEILER.

In their experimental work they found that they could not produce lesions resembling the natural condition with any of the visible bacteria obtained from lesions unless deep puncture was resorted to in the inoculation. On the other hand, light scarification was sufficient to allow infection to take place when an emulsion of crusts from affected lips was used. Such an emulsion was filtered through paper and centrifuged to free it as far as possible from bacteria, and it was still found to be infective. A single experiment with emulsion filtered through a Chamberland F filter gave a negative result.

In experimentally produced lesions the first evidence of infection appears in 36 to 48 hours after infective material has been rubbed over light scarifications. Close inspection reveals the presence of very

small flat vesico-pustules. Shortly after this a gummy exudate appears on the surface and then becomes dry. By further exudation the scab increases in thickness and goes through changes in colour of yellow, brown to grey. The period required for this is about a week. The condition does not appear to spread to other parts except by direct infection. Scabs fall off in about a fortnight leaving an area of healed skin over which hair grows again. Removal of scabs before they fall off naturally exposes a raw surface prone to bleeding, and another scab forms.

In natural cases the lesions on the muzzle and lips may be so extensive as to interfere with feeding, and there is thus marked loss of general condition.

It can be shown experimentally that recovery from the lesions is brought about by the establishment of a condition of immunity. Lesions occur naturally around the nostrils and eyes, skin of the coronet, mucous membrane of the lip, gums, palate and tongue, and on the udder. These lesions all bear a general resemblance to each other, but owing to their position scabs do not form on lesions in the interior of the mouth. Occasionally lesions are found in the axillary and inguinal regions.

Histologically, the lesions are typically those of the pox type.

Apparently slight trauma is essential for the implantation of the virus, even under natural conditions.

The immunity produced by infection is a general one and not purely local.

The virus is resistant to desiccation, and it can be shown that scabs preserved at room temperature in a loosely plugged bottle retain their power of infecting for over a year. Treatment consists in isolation of infected animals and treatment with mild antiseptics. 5 per cent. sulphate of copper is good for swabbing sores after detachment of scabs. A useful ointment contains :—

5 parts coal tar dip.
10 ,, sublimed sulphur.
100 ,, tallow, vaseline, or lard.

DU TOIT (P. J.). **The Nature and Duration of the Immunity against Bluetongue in Sheep.**—*Union of S. Africa. 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 69–78.

The experiments were undertaken because complaints were received occasionally that the immunity resulting from the use of bluetongue vaccine was not serviceable for a year.

In the experiments vaccinated sheep were tested at intervals with the homologous or a virulent heterologous strain. Groups of 10 sheep were tested with the homologous strain up to 12 months and 10 were likewise tested with the heterologous strain of virus. In each group tested at 12 months 4 were completely immune, some gave mild or doubtful temperature reactions, and the remainder gave typical temperature reactions, but showed no clinical symptoms.

The vaccine therefore seems to protect against serious illness after a year, even when a heterologous strain is used.

It is emphasized that the experiments were carried out under laboratory conditions, and somewhat inferior results might have been obtained in the veld.

DU TOIT (P. J.). **Studies on the Virus of Bluetongue.**—*Union of S. Africa. 15th Report, Director Vet. Services.* Vol. 1. 1929. pp. 79–93.

The virus used for the preparation of bluetongue vaccine in the current issue was that originally used by THEILER in 1905, and it was thought that after so many years (54th generation) it might have lost some of its immunizing properties. It had failed to produce fatal infection from the 11th generation onwards. Isolation of a new strain and preparation of vaccine on the lines practised by THEILER was carried out. The passage of virus through sheep caused it to lose its virulence at the 11th generation, and a batch of sheep inoculated with the 33rd generation were found to be solidly immune three months after they had been vaccinated.

The standard routine of vaccine preparing has been to mix in equal amount blood from inoculated sheep on the 9th day and a 50 per cent. solution of glycerin containing 0·5 per cent. potassium oxalate and 0·5 per cent. carbolic acid.

The question has been raised whether the vaccine-producing sheep could be utilized more economically, and it was decided to test this, not by reducing the dose to be injected, but by diluting the blood further, keeping the dose of vaccine at 1 cc. Various experiments are detailed in which different dilutions, etc., were used, and from these it emerged that dilutions of blood to glycerin mixture of 1 : 2 and 1 : 3 deteriorated within a few months and failed to immunize.

A modification was therefore made in the diluting fluid and the prescription used during 1927 and 1928 was :—

Blood	33 per cent.
Glycerin	25 „ „
Water	41 „ „
Potassium oxalate...	0·25 „ „
Carbolic acid	0·25 „ „

In making up the glycerin mixture in bulk the following quantities were used :—

Glycerin	500 cc.
Potassium oxalate...	5 g.
Carbolic acid	5 g.
Water	833 cc. (instead of 500 cc. as before).

Blood was drawn into this in the proportion of 1 of blood to 2 of glycerin solution.

Vaccine prepared in this way is entirely satisfactory, and there is a great economy, for with the same amount of blood 50 per cent. more vaccine is prepared.

The third section of this paper deals with the resistance of the virus (vaccine). Like the virus of horse sickness that of bluetongue is very resistant. In decomposed blood it will remain active for long periods.

The opportunity offered to test two bottles of vaccine one 10½ years old and the other 18½ years old. Details of experiments are given and the conclusion was drawn that the vaccine 18½ years old was still capable of producing reactions in the majority of the animals used, but the immunity conferred appeared to be weak.

In the fourth, and final, sections of the paper the persistence of the virus in recovered animals is dealt with. The point is of importance, because bluetongue has a seasonal distribution, i.e., it is limited to

the rainy season, and as it is probably insect transmitted some means of bridging the dry season (May to October) must exist. The mosquitoes, upon which suspicion rests, are shortlived, and it is improbable that they hibernate. It was THEILER'S view that immune animals do not retain the virus in their blood.

Experiments covering a considerable period of time were carried out with two sheep, and the results indicated that the virus may persist in the blood for periods up to four months, and possibly longer, but its presence cannot be demonstrated by the inoculation of susceptible sheep at all times during that period.

DONATIEN (A.) & LESTOQUARD (F.). Recherches sur l'immunisation contre la peste porcine. Résultats obtenus. [**Immunization against Swine Fever. Results obtained.**]—*Ann. Inst. Pasteur.* 1929. Dec. Vol. 43. No. 12. pp. 1560–1598. With 18 text figs.

This paper is based upon research carried out at the Pasteur Institute of Algeria following heavy losses from swine fever in that country at the end of 1925. A series of outbreaks has occurred at intervals of approximately four years since 1912, and they have become increasingly serious, so much so that many breeders gave up the industry. The authors satisfied themselves by experimental inoculation that the disease in question actually was swine fever, caused by the filterable virus.

Details are given of experiments in which the authors tested the value of bacterial vaccines prepared from lesions complicating the primary condition, a formolized virus and a sensitized virus. They found that none of these was of any value, and they therefore had to rely upon methods involving the use of serum from hyperimmunized pigs. The authors have bled their hyperimmunized animals either from the jugular or from the mammary vein, and they appear to prefer the latter. They have tried bleeding from the tail, but were unable to get blood in sufficient amounts. The methods adopted for drawing the blood are figured and described.

On infected premises the serum alone is used, but on uninfected premises in danger of becoming infected the simultaneous method is employed. Sucking pigs are given serum alone and the double inoculation after weaning.

Encouraging results have been obtained, and it has been found possible to breed and fatten pigs in places where, without immunization, it would have been impossible.

Owing to local conditions it is probable that better control of the disease will be achieved by immunization than by regulations.

The " pneumo-enteritis " which is referred to in French and Algerian regulations does not exist in Algeria, and the use of the name had lead to a certain amount of confusion. In all cases of " red disease " either swine erysipelas or actual swine fever has been diagnosed. Enteritis due to *B. suipestifer* and contagious pneumonia due to *B. suisepticus* or a streptococcus have not been found.

The authors hold that the control of the disease must be based upon accurate diagnosis in the first place and this must be followed by protective inoculation. Both of these must be the duty of a sanitary veterinary service, but neither can function effectively until the breeders have been educated as to their value.

REMLINGER (P.) & BAILLY (J.). La rage du pigeon. [**Rabies in the Pigeon.**]—*Ann. Inst. Pasteur.* 1929. Dec. Vol. 43. No. 12. pp. 1543–1559.

Although highly virulent strains are used for the intracerebral inoculation of pigeons the birds never develop a furious form of rabies. Paralysis and disturbed equilibrium are the only symptoms seen. As in the case of poultry, there is a tendency for the disease to run a chronic course, and there is also a marked tendency to recovery. This takes place in about 50 per cent. of inoculated pigeons. Young pigeons appear to be more susceptible than adult birds, but the latter are by no means immune.

Microscopic examination shows that Negri bodies are to be found in the pyramidal cells in the postero-inferior areas of the cerebrum. There is a marked interstitial inflammation of the cerebellum, and this doubtless accounts for the disturbance of balance. In exceptional instances, as in the cock, the virus may be destroyed by the natural defences of the bird, but death may nevertheless result from the lesions produced.

Rabies in the pigeon raises an interesting question. It has been shown that if the virus be injected into the brain of a susceptible animal such as the rabbit or the dog it can be recovered, by animal passage, from the seat of inoculation up to 24 hours. It then disappears and then reappears a few days prior to the development of symptoms in the control animals. In refractory animals, such, for example, as the tortoise, a different phenomenon is observed. In this species the authors have been able to demonstrate the presence of the virus in the brain 110 days after inoculation, and only lack of tortoises prevented further tests. KRAUS and CLAIRMON reported a similar state of affairs in the cock and the pigeon, the virus being detectable up to 24 days in the cock and 26 days in the pigeon. This curious duality of behaviour of the virus of rabies in susceptible and refractory animals may possibly throw some light upon the microsporidian nature of the virus of rabies.

Further experiments in this connexion are being pursued.

BABLET (J.) & JOYEUX (B.). Sur la virulence du virus des rues tonkinois. [**The Virulence of Street Virus in Tonkin.**]—*Ann. Inst. Pasteur.* 1930. Feb. Vol. 44. No. 2. pp. 141–147. With 1 text fig.

It has frequently been stated that street virus in Tonkin is of special virulence, and this view is based upon the shortness of the period of incubation and the frequent failure of ordinary treatment. These facts seem to indicate that the virus is of exalted virulence.

Incubation period in the human subject. Details of 58 cases have been studied and in 75 per cent. of cases the incubation period ranged between 15 and 30 days. Comparing this figure with the period of incubation in Europe (BABÈS) it is found that in the largest percentage (39 per cent.) the period falls between 30 and 60 days. [An error appears to have been made in the legend below the graph given by the author. The designations of the curves would seem to have been transposed.]

Details furnished by the Veterinary College at Hanoï show that in the dog symptoms appear between 20 and 50 days after the bite, but,

as in Europe, periods of incubation shorter and longer than this are observed.

Dogs in Tonkin can be divided into three classes :—

(1) The well-cared-for animals owned by Europeans ; (2) at least as large a number of wild dogs living at large in the country ; (3) the village pariah dog.

Figures indicate that some 70 per cent. of persons bitten are bitten by wild dogs. Experimental inoculation of rabbits with nerve tissue from 8 cases of rabies in natives have resulted in the development of symptoms in 4 cases in less than 15 days, in 3 cases in 15 to 20 days, and in 1 case in 31 days.

Between January 1926 and June 1929, inoculations with medullas from suspected dogs have yielded 70 positive results. In 51 per cent. of cases the period of incubation was less than 14 days, in 43 per cent. it was normal (14–20 days), and in 5 per cent. it was abnormally long (more than 20 days). In 70 per cent. of the first group the virus was derived from wild dogs. In one case only has virus with the degree of virulence of fixed virus (killing rabbits in 8 days) been detected in Tonkin. Experiments regarding the vitality of the virus have been carried out with 2 human and 2 canine strains of virus. The viruses retained their virulence for 25 to 30 days in glycerin, and resisted desiccation for 8 to 10 days. If subjected to desiccation for 2 days prior to immersion in glycerin they retained their virulence for 15 to 20 days, and with increasing periods of desiccation prior to immersion the retention of virulence in glycerin was shortened.

PLANTUREUX (E.). Prophylaxie de la rage et vaccination préventive des chiens. [**Prophylaxis against Rabies and Protective Inoculation of Dogs.**]—*Rev. d' Hyg. et de Méd. Préventive.* 1929. July. Vol. 51. No. 7. pp. 483–488.

The author summarizes the position with regard to prevention of rabies and the protective inoculation of dogs.

There are two methods for the control of the spread of rabies. One is the slaughter of all dogs suspected, and the other is protective inoculation. The first method, owing to difficulties of proper application, has yielded unsatisfactory results both in France and in the Colonies. On the other hand, great benefits are to be expected from the second. But as it will scarcely be possible to immunize all dogs, a combination of the two methods appears to be the solution. That is to say, a rigid application of the following three measures : Protective inoculation, destruction of stray dogs, and slaughter of unvaccinated dogs that have been bitten.

CARPANO (M.). Su di una grave infezione dei cani in Egitto. [**A Serious Disease of Dogs in Egypt.**]—*Ann. d'Igiene.* 1929. July. Vol. 39. No. 7. pp. 488–509. With 4 text figs.

The author describes a disease which has been considered as rabies but which he believes to be the false-rabies of Aujeszky.

JACOTOT (H.). L'immunisation du bétail contre la peste bovine. [**Immunization against Cattle Plague.**]—*Arch. Insts. Pasteur d'Indochine.* 1929. Apr. No. 9. pp. 3–21. With 6 charts.

The author discusses the use of organ pulp vaccine, but concludes that it is by no means certain that it will replace the serum simultaneous method and simple serum injections. He thinks it possible that organ pulp may be used in the future for the preparation of more powerful antiserum.

MISCELLANEOUS.

VAN ALPHEN (A. J. S.). Inspuiten van Chloorcalcium-oplossing. [**The Injection of Calcium Chloride Solution.**]—*Tijdschr. v. Diergeneesk.* 1929. Dec. 15. Vol. 56. No. 24. pp. 1333–1335. With 1 text fig.

In making intravenous injections the author uses two canulae, one of which is sufficiently large to allow the other to pass through it, and has a pointed end for puncture of the vein. The vein is punctured by the larger canula and the smaller attached to the syringe containing the material to be injected is passed through it into the vein. The method is valuable where it is essential to prevent the escape of drugs into the subcutaneous tissue.

YAKIMOFF (W. L.) & RASTÉGAÏEFF (E. F.). Sur la question des variations cytologiques du sang des poules. [**The Cytological Variations of the Blood of Poultry.**]—*Bull. Soc. Path. Exot.* 1929. Nov. 13. Vol. 22. No. 9. pp. 766–767.

Examination of the blood of 11 birds 3 to 4 months old has yielded the following information regarding the cellular elements :—

Red corpuscles	2,088,000 to 2,672,000	
Leucocytes (average figures) :—		
Lymphocytes	58·1	per cent.
Monocytes	9·1	,, ,,
Polynuclears	29·1	,, ,,
Eosinophiles	1·4	,, ,,
Mast cells	2·3	,, ,,

There is a considerable range of variation in the figures for the various types.

The authors give details of blood counts of three birds suffering respectively from leucaemia, tuberculosis, and coccidiosis with simultaneous infestation with helminths :—

1. Leucaemia.

Erythrocytes	84,000
Leucocytes	124,000

It is stated that on one day 96·8 per cent. were polynuclears and 0·7 per cent. eosinophiles, and on the following day 99·8 per cent. lymphocytes and 0·2 per cent. monocytes.

There was very marked leucocytolysis. Of 1,065 leucocytes counted, 38 per cent. were in a condition of leucocytolysis. Apart from normal

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There was very marked leucocytolysis. Of 1,065 leucocytes counted, 38 per cent. were in a condition of leucocytolysis. Apart from normal

lymphocytes, those showing divided nuclei were 1·3 per cent. on one day and 0·1 per cent. on the following day. Among the red corpuscles normocytes, poikilocytes, polychromatophilia and oligochromaemia were seen. Thrombocytes were absent. At the post-mortem the spleen was found to be greatly enlarged.

2. Tuberculosis.

Leucocyte formula :—

Lymphocytes	4·2	per cent.
Monocytes	56·9	,, ,,
Polynuclears	33·4	,, ,,
Eosinophiles	0	
Mast cells	0·4	,, ,,

3. Coccidiosis and Helminthiasis.

Leucocyte formula :—

Lymphocytes	20	per cent.
Monocytes	8·9	,, ,,
Polynuclears	13·7	,, ,,
Eosinophiles	48·6	,, ,,
Mast cells	9·1	,, ,,

SEDDON (H. R.) & HINDMARSH (W. L.). **Feeding Experiments with *Euphorbia eremophila*.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 91–93.

This plant is distasteful to stock and produces diarrhoea, but in two experiments using two steers and two sheep no evidence of poisoning was obtained.

SEDDON (H. R.). *Euphorbia drummondii* (**"Milk Weed"**) **proved Poisonous to Sheep.**—*New South Wales Dept. Agric., Vet. Res. Rep.* 1927–28. No. 5. pp. 86–90. With 1 plate.

It has been suspected that this plant is poisonous, but the evidence has so far been conflicting. The author finds deaths occur in hungry or starving sheep suddenly having access to large quantities of the plant. Experiments in which sheep were given the plant to eat did not produce any results, but when the minced plant was steeped in water over night the liquid administered as a drench was found to be poisonous and specimens of the plant and stomach contents gave positive reactions to hydrocyanic acid.

It appears that the plant is not poisonous at all times, but the conditions under which the plant produces the glucoside are not known.

AGGARWALA (A. C.) & NANDA (P. N.). **Necrosis of the Palatal Flap in a Camel.**—*Vet. Jl.* 1930. Feb. Vol. 86. No. 2. pp. 67–68.

The authors record a case of necrosis of the palatal flap in a camel following laceration of that organ by the incisor teeth. Surgical removal was followed by complete recovery.

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